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**H48**  
**(71) Applicant**  
**Philips Electronic and**  
**Associated Industries**  
**Limited**  
**(Great Britain),**  
**Arundel Great Court, B**  
**20001 London SW1**

Arundel Street, London  
WC2R 3DT

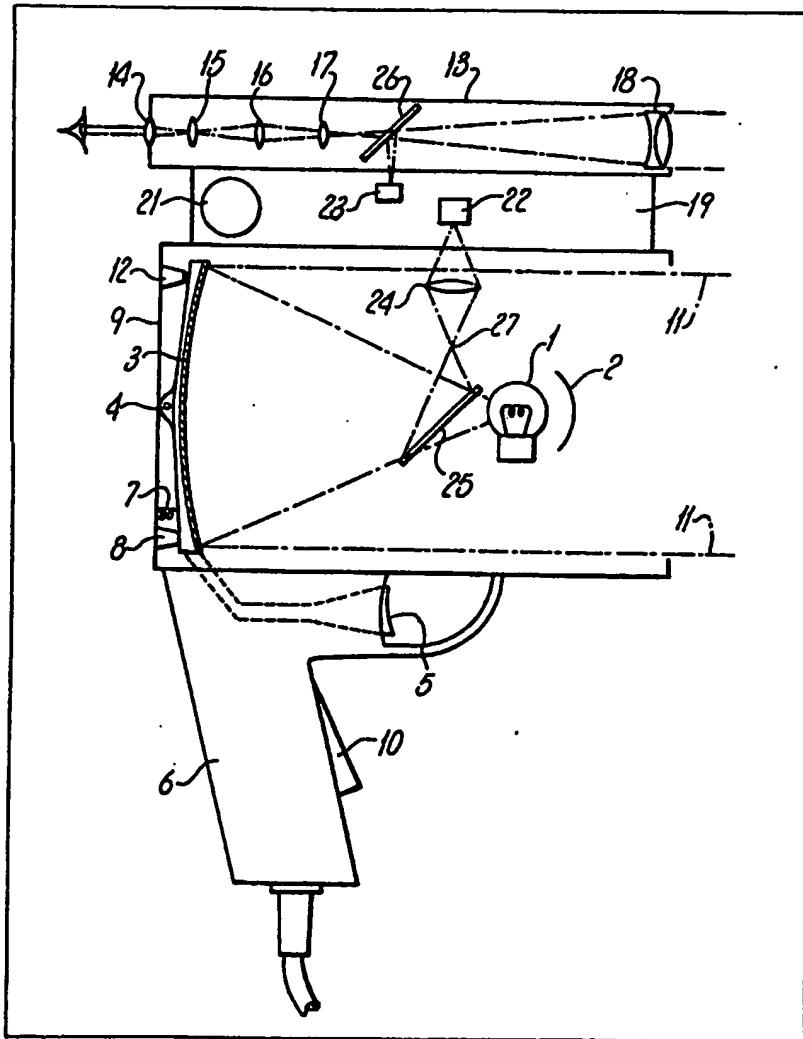
George Edward Smythe,  
Donald George Taylor  
(74) Agent and/or Address for

174) Agent and/or Address for  
Service  
R. J. Boxall,  
Mullard House, Torrington  
Place, London WC1E 7HD

**(54) Hand-directable code signalling lamp unit**

infra-red beam is coincident with the visible light beam (11) from a lamp (1). The unit receives a modulated infra-red beam from a corresponding distant unit via a lens (18), dichroic mirror (26) and a photo diode (23). The output of the diode (23) is amplified and relayed to a loudspeaker or earpiece (not shown).

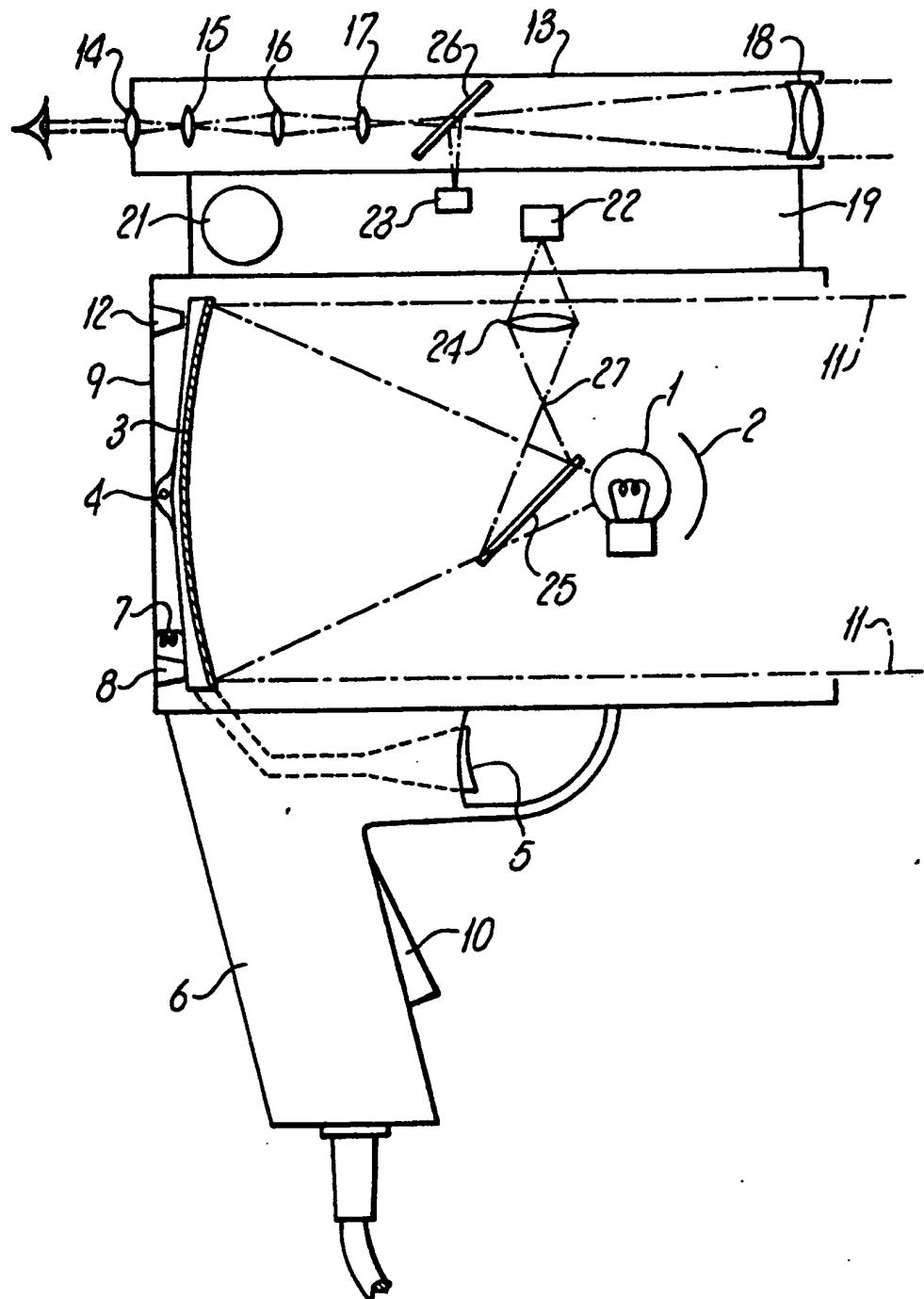
The arrangement enables two-way voice or data communication over the Infra-red beams between two line-of-sight points in addition to the light beam which is used for alignment and cell recognition purposes as well as for visual signalling if required.



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## SPECIFICATION

## Hand-directable code signalling lamp unit

This Invention relates to a hand-directable code signalling lamp unit for transmitting coded information from a first to a second of two line-of-sight points, the lamp comprising a visible light projector arranged to project a beam of visible light, manually-controllable means operable to interrupt or deflect the beam repeatedly to generate said coded information, and a sighting tube arranged on the projector with its axis parallel to the axis of the beam. One form of such a lamp unit is the well-known Aldis lamp.

Despite the proliferation of modern voice radio systems it seems probable that visual signalling by lamp will remain a method of choice for ships in close contact, e.g. in convoys, or manoeuvring in pilotage waters, because:

(i) The mode is secured against detection, interception, and interference.  
 (ii) Addressing is unambiguous in nearly every case — the beam points to the ship addressed.  
 (iii) No apparatus is required to detect the presence of a calling signal and no previous knowledge of identity (e.g. call sign) is required.  
 (iv) The apparatus required is simple, cheap and likely to be almost universally available.

Limitations of the method, however, are the slow signalling rate (equal to or less than 12 w.p.m.) and that the user must concentrate his gaze along the beam path for the whole period of the communication during which time other visual tasks must be suspended. It is also necessary for the user to be able to read Morse code.

It is an object of the Invention to increase the usefulness of such a lamp very substantially whilst mitigating at least some of the above-mentioned limitations.

According to the Invention, there is provided a hand-directable code signalling lamp unit for transmitting coded information from a first to a second of two line-of-sight points, the lamp comprising a visible light projector arranged to project a beam of visible light, manually-controllable means operable to interrupt or deflect the beam repeatedly to generate said coded information, and a sighting tube arranged on the projector with its axis parallel to the axis of the beam, characterised in that the lamp further includes means for projecting a beam of infra-red radiation substantially coaxial with the beam of visible light, and modulation means for modulating the infra-red beam at voice or higher frequencies in order to provide an Infra-red communication channel between the two points.

For present purposes, the expression "substantially coaxial" is intended to mean that the cross-sectional areas of the two beams overlap at the receiving point to such an extent that a similar unit can receive both beams.

An Infra-red voice transmission system incorporated in a binocular instrument is disclosed in United States Patent No. 3,277,303. Such a device can only operate if the users at the two

points happen to be looking at each other through their respective binocular instruments. The said specification does not disclose how a user who requires to establish the communication path can attract the attention of the desired addressee.

Also, the binocular system can only be used during daylight hours since the receiving "target point" must be visible in order to align the binocular instrument. For these reasons, infra-red systems are only suitable for use in fixed or semi-

permanent point-to-point communication systems where adequate time and care can be given to the alignment of the infra-red projector and the target receiver.

Compared with an infra-red-only system, a unit according to the invention has all the advantages detailed above coupled with the further advantages afforded by the addition of voice communication. These further advantages not only include a very great increase in the rate of

information transfer, but also (a) the unit is compatible with existing visual signalling systems, (b) that existing lamps can in many cases be modified instead of having to be replaced, and (c) that the presence of the visible beam invokes the natural protective mechanisms of the eye (blinking, aversion, and pupil diameter contraction) if the beam is inadvertently pointed at a bystander.

Whilst the lamp may be provided with means for connecting thereto a headset comprising a microphone, it preferably includes a built-in microphone for receiving the voice frequency signals to be transmitted. Since, in use, the lamp is held with the telescope eyepiece against the eye, it is more convenient to mount the microphone on the lamp unit itself.

The modulation means may amplitude-modulate or pulse-code-modulate the infra-red beam at voice or higher frequencies.

In order to provide the most advantageous system, namely one which can provide two-way conversation, the lamp unit may include receiving means for receiving a voice-frequency-modulated infra-red beam and for rendering the modulation audible. Thus each unit may simultaneously transmit and receive voice-frequency information.

In the lamp unit, the means for transmitting the infra-red beam may be adjacent the light projector. In this case the axial spacing between the infra-red and visible light beams is so small that their cross-sectional areas at the receiving point substantially overlap and their axes are regarded as being substantially coaxial for present purposes. Alternatively, the arrangement may be such that the projected infra-red beam is precisely coaxial with the projected visible light beam; i.e. they are both projected from the light projector. This not only provides a particularly convenient arrangement, but also ensures that a receiver located anywhere within the boundary of the visible light beam must inevitably receive the infra-red beam.

The above-described arrangements are suitable for use in newly-manufactured devices. There are, however, very many lamps units of the visible-

light-only type in use, in which case an infra-red projector may be added to such existing units in order to constitute a lamp unit according to the invention.

5 It is clearly preferable that the lamp unit should provide for two-way voice-frequency transmission so that conversation may take place in both directions between the two points. Accordingly the lamp unit may additionally comprise receiving 10 means for receiving a voice-frequency-modulated infra-red beam from a corresponding lamp unit at the second of the two points and for rendering the modulation audible. Conveniently, the sighting tube may be a telescope arranged to receive the 15 modulated infra-red beam. Alternatively, the infra-red receiving means may be provided additionally to the light projector and telescope or viewing tube.

An embodiment of a lamp unit in accordance 20 with the invention will now be described with reference to the sole Figure of the accompanying drawing.

Figure 1 shows a lamp unit which includes a known type of signalling lamp comprising a light 25 source (incandescent lamp) 1 provided with a reflector 2 which reflects light from the lamp back to the centre of the filament and also prevents any light from the lamp being transmitted directly from the lamp unit. A rockable 30 concave mirror 3 is manually rockable about a pivot 4 by means of a trigger 5 and is so arranged that its focal point lies in the filament of the lamp 1. The mirror is shown in its operated position, that is to say with trigger 5 depressed in the 35 handle 6 against the restoring force of a spring 7 such that a portion of mirror 3 abuts a first projection 8 in a housing 9 of the signalling lamp. In this operated position shown, a beam of light is projected from the lamp as shown by the broken 40 lines 11. In practice, this beam is arranged to have a small divergence angle of, for example, 5° so that it is readily visible at a distant observation point arranged on the axis of the projector.

If the trigger 5 is released, the mirror 3 rocks 45 about pivot 4, due to the restoring action of spring 7, until it abuts a second projection 12 in housing 9. In this position, mirror 3 deflects the beam of light upwards (as viewed in the Figure) to such an extent that it is no longer visible at the observation 50 point. In use, the trigger is operated in such a manner that the distant observer sees a series of short and long light pulses in the Morse code. The lamp is operated from an external power supply (not shown), typically 12 volts, which is switched 55 on by depressing a lever 10 in handle 6.

In order to direct the light beam precisely to the distant observation point, a sighting tube 13 is provided having its axis adjacent and parallel to the axis of the light beam with the trigger 5 in the 60 operated position. In this embodiment, the sighting tube is in the form of a telescope provided with lenses 14 to 18 in known manner.

To this known arrangement is added a control 65 unit 19 which includes a microphone 21, an infra-red-emitting diode, or laser 22, a photo diode 23,

and a loudspeaker (not shown). Further additions are a lens 24, and two dichroic mirrors 25 and 26 which reflect infra-red radiation but are transparent to visible light.

70 To use the lamp unit, the operator holds the unit with the telescope eyepiece to his eye, operates the trigger 5 to establish the axial light beam from the projector, and adjusts the position of the lamp unit so that the required distant point 75 is visible in the telescope. The light beam is seen by the distant observer who then goes through the same alignment procedure with a corresponding lamp unit to establish a communication path between two lamp units.

80 With the lamp unit in position, the microphone 21 is sufficiently close to the user's mouth to be able to pick up speech signals and to convert them to voice-frequency electrical signals. These signals are arranged, by means not shown, to cause the 85 light-emitting diodes 22 to emit infra-red light with its intensity modulated in dependence upon the voice frequency signals. Focussing lens 24 and dichroic mirror 25 are so arranged that the point 27 at which the infra-red rays emitted by diode 22 90 are focussed by lens 24 is the focal point of mirror 3. In the manner a beam of modulated infra-red rays is projected coaxially with the light beam. At the distant point, the infra-red beam is received by the aligned telescope 13 of a corresponding lamp 95 unit. The beam is reflected by dichroic mirror 26 on to the photo diode 23 arranged at the focus of lens 18. Diode 23 converts the modulated infra-red beam into correspondingly modulated electrical signals which are then amplified and fed 100 to the loudspeaker (not shown) arranged at a convenient point on the lamp unit, for example on the far side of the control unit 19.

In this manner, two-way conversation can take place between the two operators concerned.

105 Additionally or alternatively, the infra-red beams can be used for the transmission of digitally-coded signals using, for example, a known CCITT pulse modulation code. This would require an additional coding/decoding unit which 110 could either be incorporated in the lamp unit or be provided as a separate unit which may be plugged into the lamp unit.

If the lamp unit is to be used in very noisy surroundings, an earpiece or earphones may be 115 provided instead of, or in addition to, the loudspeaker.

It is to be understood that the particular form of light projector used in the lamp unit according to the invention is not limited to the particular form 120 shown in Figure 1. Other types of known projector may of course be used, for example the type employing a manually-operable moving vane light shutter. In such projectors, the mirror 3 is permanently fixed in the position shown in 125 Figure 1.

The necessary electronic modulation-demodulation circuits are described, for example, in the above-mentioned United States Patent No. 3,277,303.

130 In the foregoing embodiment, the infra-red

beam is transmitted from the light projector and is received via the telescope. By interchanging the diodes 22 and 23, together with their associated circuits, the infra-red beam may be transmitted via the telescope and received via the light projector.

In that very many Aldis-type signalling lamps are in current use, particularly for marine applications where it is a requirement that every ship having a gross rated tonnage in excess of 500 has to carry a visual signalling lamp, these lamps may readily be converted into lamp units according to the invention by providing them with an add-on unit. Such a unit would comprise, in addition to the electronic circuitry, two tubes similar to telescope 13 but only having a simple lens arrangement such as lens 18. One of the tubes would have a light-emitting diode 22 arranged in the focal point of the lens and the other tube having a photo diode 23 correspondingly arranged.

The provision of an infra-red channel in addition to the visual signalling channel very considerably extends the possible uses of such lamps to non-naval applications where a radio communication system might interfere with existing radio communication systems. One example of such use is for local signalling on airfields.

When digitally coded signals are transmitted via the infra-red beam, the modulation frequency or frequencies is/are, in general, higher than voice frequencies.

Due to the weight of the lamp unit, it may conveniently be mounted on a support, such as a tripod, having a universal joint such that the unit may be freely directable by hand.

#### CLAIMS

1. A hand-directable code signalling lamp unit for transmitting coded information from a first to a second of two line-of-sight points, the lamp comprising a visible light projector arranged to project a beam of visible light, manually-

controllable means operable to interrupt or deflect the beam repeatedly to generate said coded information, and a sighting tube arranged on the projector with its axis parallel to the axis of the beam, characterised in that the lamp further includes means for projecting a beam of infra-red radiation substantially coaxial with the beam of visible light, and modulation means for modulating the infra-red beam at voice or higher frequencies in order to provide an infra-red communication channel between the two points.

45 2. A lamp unit as claimed in Claim 1, wherein the lamp includes a built-in microphone connected to the modulation means.

50 3. A lamp unit as claimed in Claim 1 or 2, wherein the modulation means amplitude-modulate the infra-red beam at voice frequencies.

55 4. A lamp unit as claimed in Claim 1 or 2, wherein the modulation means pulse-code-modulate the infra-red beam.

60 5. A lamp unit as claimed in any previous Claim, the arrangement being such that the infra-red beam is projected from the light projector with the visible light beam.

65 6. A lamp unit as claimed in Claim 5, wherein the sighting tube is a telescope arranged to transmit the infra-red beam.

70 7. A lamp unit as claimed in any of Claims 1 to 4 including means separate from the projector and a sighting tube arranged to transmit the infra-red beam.

75 8. A lamp unit as claimed in any previous Claim, including receiving means for receiving a voice frequency-modulated infra-red beam from a corresponding lamp unit at the second of the two points and for rendering the modulation audible.

80 9. A lamp unit as claimed in Claim 8, wherein the sighting tube is a telescope arranged to receive the modulated infra-red beam.

10. A hand-directable code signalling lamp unit substantially as herein described with reference to the accompanying drawings.